



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

B
7770
15



B 1770.15



Harvard College Library

FROM

The Author

cover

B 7770.15

Design of the Illumination
of the
New York City Carnegie Libraries

BY

L. B. MARKS

AUTHORIZED REPRINT OF A PAPER PRESENTED AT
THE SECOND ANNUAL CONVENTION OF THE
ILLUMINATING ENGINEERING SOCIETY.
PHILADELPHIA, OCTOBER 5-6,
1908

Phil.
1908



The Author.

DESIGN OF THE ILLUMINATION OF THE NEW YORK CITY CARNEGIE LIBRARIES.¹

BY L. B. MARKS.

The design of the illumination of a public library involves considerations which are quite unlike those that ordinarily confront the illuminating engineer, and are in many respects more



Fig. 1.—First Floor, Carnegie Library.

difficult to meet than in almost any other class of buildings. The design must secure:

(1) Sufficient illumination on the reading tables and book shelves to meet the demands of a wide class of readers of various ages and conditions of eyesight, taking into account the fine print in some of the books and the difficulty of reading titles of books in position on the shelves. Some of the books are worn

¹ A paper presented at the Second Annual Convention of the Illuminating Engineering Society, Philadelphia, October 5-6, 1908.

by frequent handling, and the titles become more or less obscured.

(2) Low intrinsic brightness of light sources and freedom from glare, and so far as possible removal of lights from the ordinary field of vision.

(3) Sufficient illumination for the library staff to oversee the entire floor.

(4) Sufficient illumination to provide a moderate reading light in all parts of the room, to admit of the relocation or



Fig. 2.—Second Floor, Carnegie Library.

addition of furniture, such as portable magazine filing racks, etc.

(5) Moderate cost of installation.

(6) Economy of operation. This must take into account not only the system of illumination and type of lamps used but also the switching arrangements.

(7) Simplicity in construction and convenience in operation. This must take into account the character of help in local charge of the equipment.

(8) Aesthetic design of fixtures, and attractive appearance of the reading rooms at night.

The present paper is a preliminary one and deals with the design of illumination of the new Carnegie Branches of the New York Public Library, and in particular with the St. Gabriel's Park Branch which is representative of seven other Carnegie Library buildings which are now under construction in New York City. The St. Gabriel's Park Branch of which Messrs.



Fig. 3.—Third Floor, Carnegie Library.

McKim, Mead & White were the architects, was opened to the public a few months ago. Drawings of floor plans showing location of lamp outlets, switches, etc., as well as dimensions of rooms in the building and position of furniture are given herewith, (Figs. 5-10). The light units are designated at each outlet and shown on the plans on the basis of 50 watt units. Fixture drawings (Figs. 12-25) by Mr. W. S. Kellogg, Supervising Architect of the Works, schedule of lamps, and photographs of the four main floors of the building are also given.

The lighting service is taken from the direct current three

wire mains of the New York Edison Company and enters the building in the basement from which it is distributed throughout the building through panel boxes located on each floor. These panel boxes contain the switches which control the individual circuits.

DESCRIPTION OF ROOMS.

BASEMENT:

The basement contains the packing and receiving room, boiler



Fig. 4.—Roof Reading Room, Carnegie Library.

room, coal vault, store room and lavatory. The walls and ceilings of this room are white in color.

FIRST FLOOR:

The main entrance to the building is on the first floor. With the exception of the vestibule and small office which are separated from the rest of the room by glazed partitions, this floor constitutes one large room. In the front of the room is the circulating department, in the middle the application and delivery desk, and in the rear portion the free standing book stacks and the reference room. These departments are separated from each

other by low rails or low bookshelves. Along the walls of the room are bookcases about 7 feet high. The walls are cream color and the ceiling white. The public has access to all of the bookshelves. In the entrance hall are located two exhibition

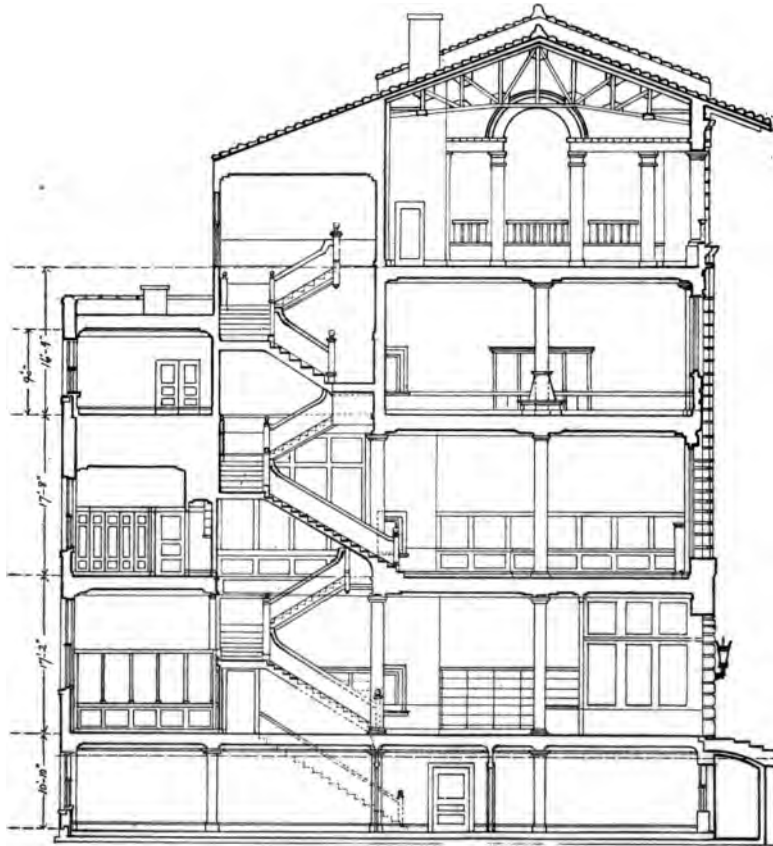


Fig. 5.—Longitudinal Section of Library Building.

racks of the swing frame type. The switches for controlling the lights are in charge of the librarian.

SECOND FLOOR:

This floor contains the children's reference room and circulating department, and the librarian's room. The conditions are very much the same as on the floor below.

THIRD FLOOR:

The main reading room and the janitor's apartments are on

the third floor. In addition to the reading tables in the main

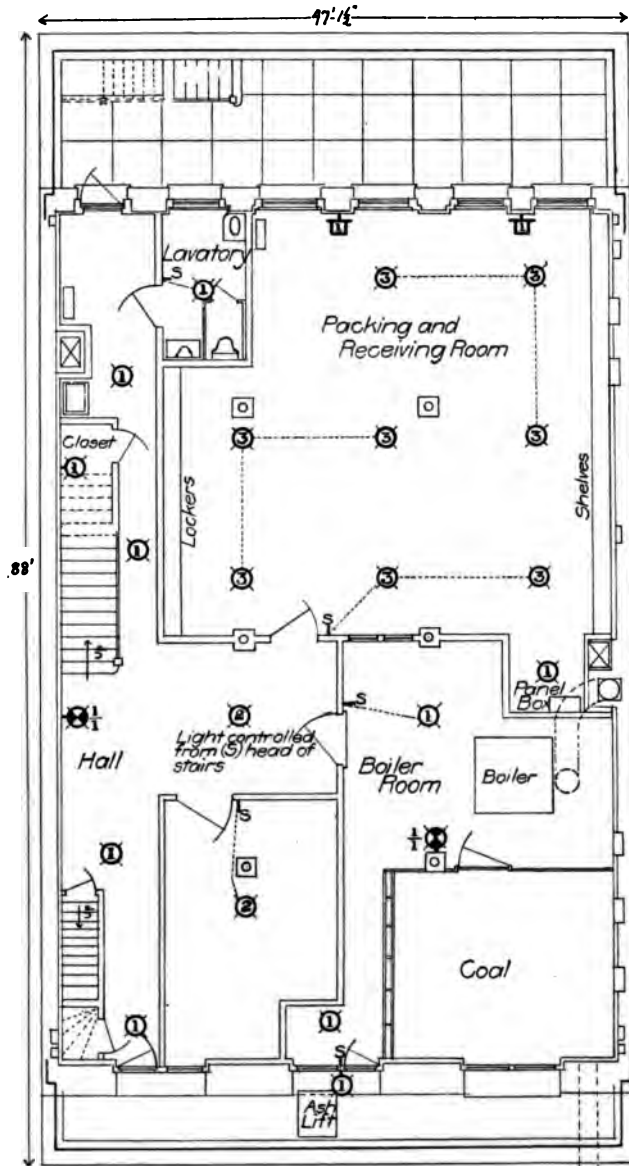


Fig. 6.—Basement Plan.

room there are two circular seats for readers around the col-

umns; also two exhibition cases for the display of photographs, prints, etc. The room contains portable magazine and newspaper racks but has no bookshelves.

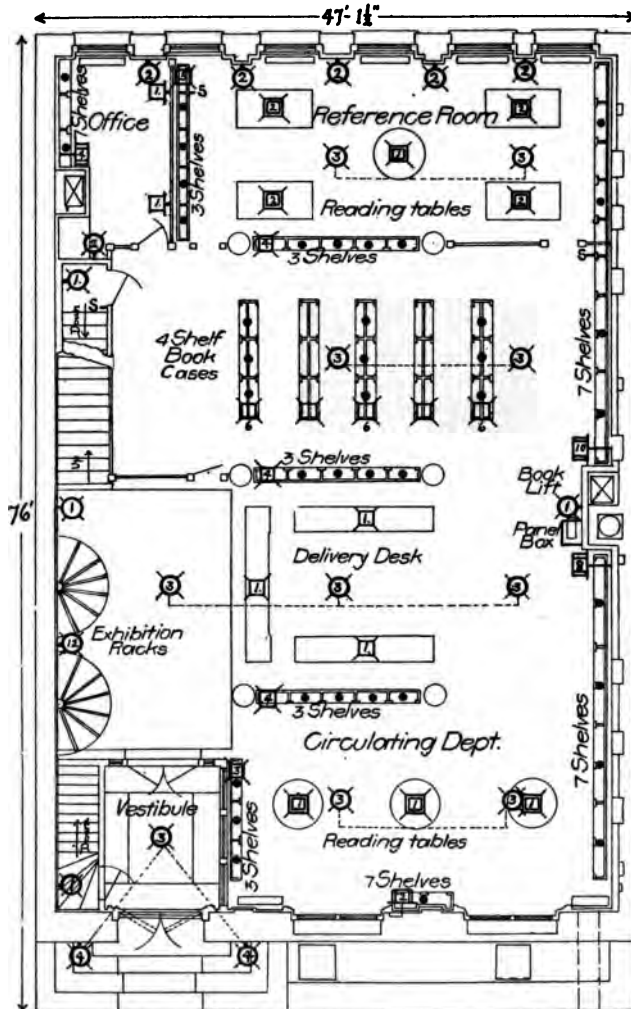


Fig. 7.—First Floor Plan.

ROOF:

The roof is used as an open air reading room. The floor of this room is of dark colored tile, the walls red brick, and the

ceiling formed by a roof of dark colored tile supported on trusses.

CARNEGIE LIBRARY. ST. GABRIEL'S PARK BRANCH.

FIXTURE AND LAMP SCHEDULE.

Basement. Height, 9'-6".									
No. of pieces	Drawing No.	No. of lamps		Description of lamps		Height of globe holder	Name of room Location of lamp	Remarks	
		Gas	Elec.	Special	Regular				
1	4 A		1		16-c.p. Edison		Front area	Bracket lamp weatherproof socket	
2	15 A		2		16-c.p. Edison Frosted	7'-0"	Boiler room Coal and ash	Ceiling pendant	
1	3 A	1	1		8-c.p. Ed.			Comb. bracket	
1	1 A		1		8-c.p. Ed.			Elect. bracket	
4	15 G		4		16-c.p. Ed.	7'-6"	Halls	1-lamp pendant 6" ball Crystal rough outside	
1	15 H		1		32-c.p. Ed.	7'-8"	Halls	1-lamp pendant 8" x 4" C. R. O. ball	
1	3 F	1	1		8-c.p. Ed.		Hall at foot of stairs	1 comb. bracket chain pull	
1	1 F		1		8-c.p. Ed.		Closet under stairs	Elect. bracket lamp up, Ch.p.	
1			1		16-c.p. Ed. Frosted	At ceil.	Toilet	Elect. ceiling outlet prismatic	
1	17 B		1		16-c.p. Ed. frosted tip	7'-6"	Work rm. by B.L.	1-lamp pendant Ch. p.	
8	6 B		24		16-c.p. Ed. Frosted tip	7'-6"	Work rm. ceil.	Ceil. pendant Length of arm = 1'-3" each 3 elec.	
1	15 A		1		32-c.p. Ed.	9'-0"	Store room	1-lamp pendant	
2			2		16-c.p. Ed. Frosted		2 flexible	portables with fluted glass shades	

<i>First Story. Height, 15'-3''.</i>						
No. of pieces	Drawing No.	No. of lamps		Description of lamps	Height of globe holder	Name of room Location of lamp
		Gas	Elec.	Special Regular		
1	18		1	187-watt Gem	12'-6''	Ent. vest. 1-lamp pend-ball 16''
1	2	1				Ent. vest. Gas wall bracket
1	3 F	1	1	8 c.p. Ed.		Top of stairs by ent. vest. 1-lamp bracket, smoke bell over, ch. p.
2	19		12	8-c.p. Ed. Frosted tip	7'-3½''	On west wall over swinging frames
1	3 F	1	1	8-c.p. Ed.		Foot of stairs up 1 comb. bracket ch. p.
1	1 F		1	8-c.p. Ed.		Under main stairs on the landing 1 elect. bracket, lamp up. Ch. p.
2	5 B		4	16-c.p. Ed. Frost. tip		Office 2-lamp brackets ch. p.
4	5 B		8	16-c.p. Ed. Frost. tip		Reference Rm. 2-lamp brackets Proj. 15'' from wall to cen. of lamp; lamps down. Ch. p.
1	1 B		1	16-c.p. Ed. Frost. tip		Book lift 1-lamp bracket lamp down Ch. p.
9	18		9	16-c.p. Ed.	12'-6''	Main room Ceiling pendant 16-in CRO ball
2	10		4	16-c.p. Ed. Frosted		Shelves in office 2 mirror reflectors
10	10		20	16-c.p. Ed.		7 shelf cases in main room Mirror reflectors
20	9		20	8-c.p. Ed		3 shelf cases in main room Revolving fixtures
9	R 7 D		18	20-c.p. 50-watt Gem	7'-2''	4 shelf free standing cases Exact spread of arms given later (about 5'-0'')
3	8 E		3	16-c.p. Ed Frosted		Delivery desks Adjustable revolving standard

First Story.—(Continued).

No. of pieces	Drawing No.	No. of lamps		Description of lamps		Height of globe holder	Name of room Location of lamp	Remarks
		Gas	Elec.	Special	Regular			
3	14		3	40-watt Tantalum Frosted			Circulation room	On round tables
1	14		1	40-watt Tantalum Frosted			Reference room	On round tables
4	L 7 C		8	16-c.p. Ed. Frosted			Reference room	Rectangular tables Spread = 3'-0'' for 6'-0'' table and 2'-6'' for 5'-0'' table
2			2	16-c.p. Ed. Frosted			2 flexible portables with fluted glass shades	

Second Story. Height, 15'-6''.

No. of pieces	Drawing No.	No. of lamps		Description of lamps		Height of globe holder	Name of room Location of lamp	Remarks
		Gas	Elec.	Special	Regular			
1	3 F	1	1	8-c.p. Ed.			Stair landing 1st to 2nd	Combination bracket Ch. p.
1	3 F	1	1	8-c.p. Ed.			Foot of stairs up	Combination bracket Ch. p.
1	1 B		1	16-c.p. Ed. Frosted tip			Book lift	Bracket, Lamp down Ch. p.
2	5 B		4	16-c.p. Ed. Frosted tip			Rear of circulation room	2-lamp bracket, Lamps down, Lamps 15'' from wall Ch. p.
4	1 B		4	16-c.p. Ed. Frosted tip			Column over seat	1-lamp bracket Lamps down
1	1		1	8-c.p. Ed.			Slop sink	Lamp down No shade Ch. p.
1			1	16-c.p. Ed. Frosted tip			Toilet	Elec. ceiling outlet Prismatic

Second Story.—(Continued).

No. of pieces	Drawing No.	No. of lamps		Description of lamps		Height of globe holder	Name of room Location of lamp	Remarks
		Gas	Elec.	Special	Regular			
1	6 B		6		16-c.p. Ed. Frosted tip	7'-6'' (ceiling) 12'-0''	Librarians room	6-lamp ceil. pendant Spread=2'-6''
2	1 B		2		16-c.p. Ed. Frosted tip		Librarians room	Brackets, Lamp down, Ch. p.
16	9		16		8-c.p. Ed.		3 shelf cases	Revolving bracket
11	11		22		16-c.p. Ed.		5 shelf cases	Mirror reflector
4	11		8		16-c.p. Ed.		Bulletin board	Mirror reflector
2	14		2	40-watt Tantalum Frosted			Circulating room	Round tables
4	L 7 C		8		16-c.p. Ed. Frosted tip		Reference room	Rectangular tables,
3	8 E		3		16-c.p. Ed. Frosted tip		Delivery desk	Revolving Adj. Standard
9	18		9		187-watt Gem	12'-6''	Ceiling main room	16'' C. R. O. Pend. balls

*Third Story. Height, 15'-0''.**Janitors Apartments. Height, 9'-0''.*

No. of pieces	Drawing No.	No. of lamps		Description of lamps		Height of globe holder	Name of room Location of lamp	Remarks
		Gas	Elec.	Special	Regular			
6	18		6		187-watt Gem	12'-6''	Ceil. main room (reading)	16'' C. R. O. Pend. balls
3	3 F	3	3		8-c.p. Ed.		Comb. brackets on stairs, Ch. p.	
2	3 F	2	2		8-c.p. Ed.		Janitors Hall	Comb. brack- ets, Smoke bells, Ch. p.
4		4	4		16-c.p. Ed.		Janitors bed rooms	Comb. brack- ets, Smoke bells, Ch. p.

Third Story.—(Continued).

No. of pieces	Drawing No.	No. of lamps		Description of lamps		Height of globe holder	Name of room Location of lamp	Remarks
		Gas	Elec.	Special	Regular			
1	3 F	1	1		16-c.p. Ed.		Janitors bath	Comb. brackets, Smoke bells, Ch. p.
1	6 G	4	4		16-c.p. Ed.	6'-6"	Janitor's living room	Comb. ceiling pendant
1			4		16-c.p. Ed.	8'-0"	Kitchen ceiling	Spread=2'-0" Cluster porcelain reflector
1	3 F	1	1		16-c.p. Ed.		Kitchen wall	Comb. bracket over tubs
1	1 A		1		8-c.p. Ed.		Janitor's stairs to roof	Ch. p. Lamp up
10	13		10	Straight filament lamps			Reading room	
2	1 B		2		16-c.p. Ed.		Ex. cases	"Linolite"
					Frosted		Reading room over folio cases	Lamp down 15" from wall
8	1 B		8		16-c.p. Ed.		Reading room, Cols.	Ch. p. Lamp down 15" from wall
1	1 B		1		16-c.p. Ed.		over seats	Ch. p.
					Frosted		Book lift	Lamp down
9	L 7 C		18		16-c.p. Ed.		Reading room tables	Ch. p.
					Frosted			
2			2		16-c.p. Ed.		2 flexible portables with fluted glass shades	
					Frosted			

Roof. Height, 20'-0" to truss.

No. of pieces	Drawing No.	No. of lamps		Description of lamps		Height of globe holder	Name of room Location of lamp	Remarks
		Gas	Elec.	Special	Regular			
3			3		32-c.p. Ed.	8'-0"	Hall	1-lamp, Elec. pendants Prismatic enameled
					Frosted			
2	2		2				N. wall	Gas brackets
2	1 A		2		16-c.p. Ed.		Book lift and motor room	Ch. p.
23	16		16		125-watt Gem with frosted tip	7'-0"	From stair platform to shade holder	Enameled reflectors

ILLUMINATION TESTS.

Tests of illumination were made under my direction by the Electrical Testing Laboratories, on the first floor and in the roof reading room.

The first floor dimensions are approximately 67 feet by 44

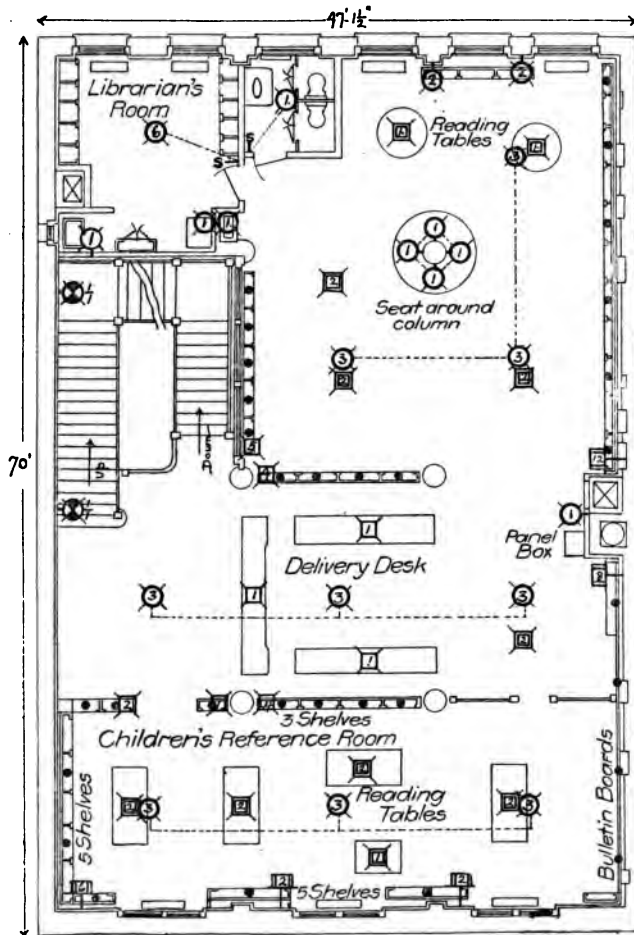


Fig. 8.—Second Floor Plan.

feet, and the height of the ceiling is 15 feet 3 inches in the clear. General illumination is provided by 10, 187 watt ceiling pendant lamps, each equipped with a prismatic reflector, both lamp

and reflector being enclosed in a 16 inch crystal globe roughed on the outside. The height of the lamps above the floor is 12 feet 6 inches. The localized illumination is provided on the reading tables, stacks, bookshelves, etc., and may be used in whole or in

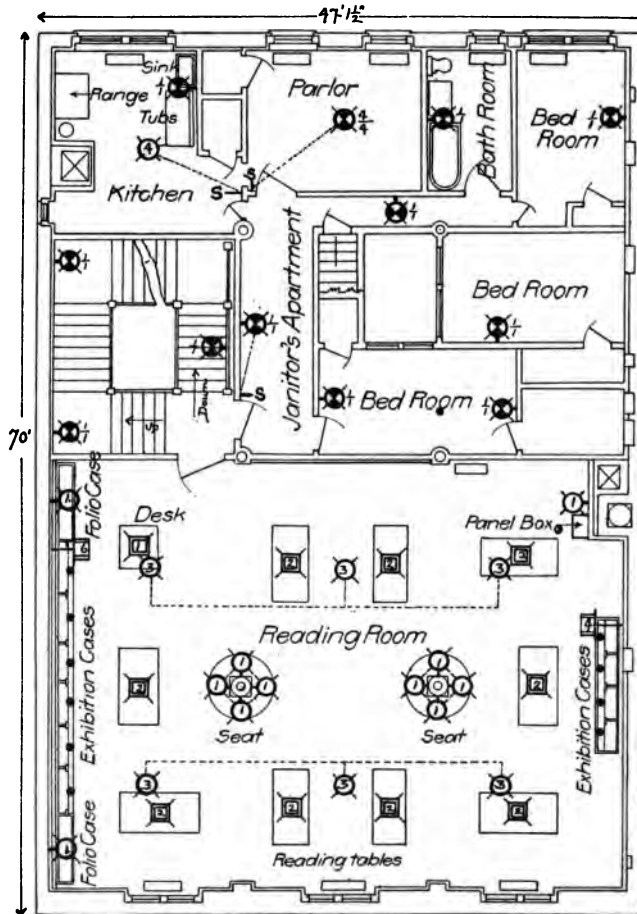


Fig. 9.—Third Floor Plan.

part depending upon the requirements, permitting lamps in the reading tables or on bookshelves, to be extinguished when not required.

The free standing bookcases located near the rear of the room are 52 inches high and 9 feet 6 inches long, divided into

four shelves 9 inches apart. These are illuminated by 50 watt Gem lamps, backed by prismatic reflectors which are covered by opal shades, green on the outside, located 6 feet 6 inches

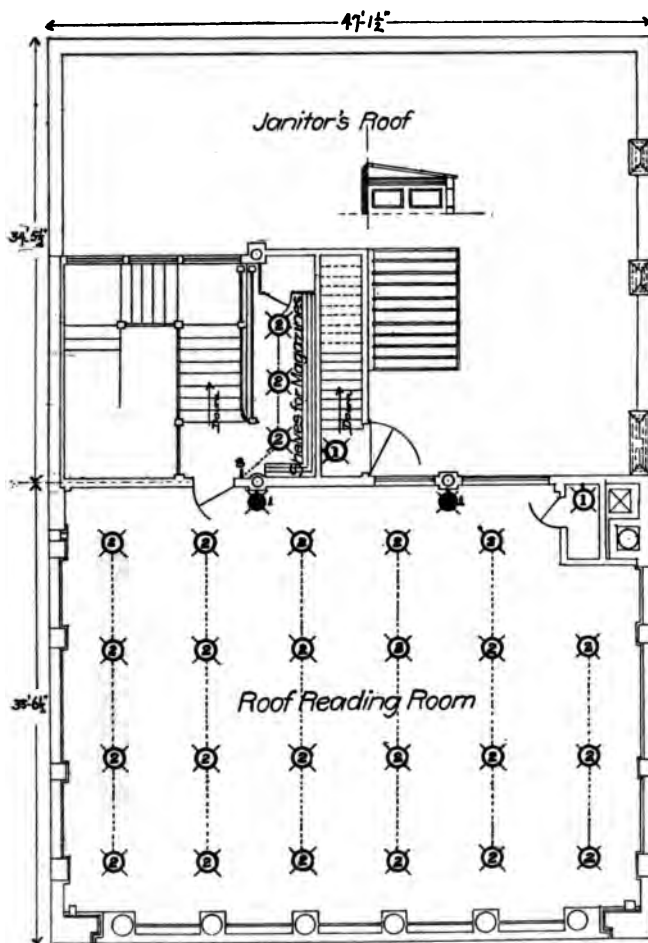


Fig. 10.—Roof Reading Room Plan.

above the floor, and immediately over the center of the aisles between stacks as illustrated on the diagram, (Fig. 28).

The seven shelf bookcases upon which tests were made are illuminated by special two-socket mirror trough wall reflectors

holding the lamps in a horizontal position, and equipped with

- ⊗ —Ceiling outlet, electric.
- ⊗ —Bracket outlet, electric.
- ⊗ —Bracket outlet, combination.
- ⊞ —Baseboard receptacle.
- ⊞ —Floor outlet, flush.
- ⊞ —Floor outlet, extension.
- ⊗ —Gas outlet.
- ⊞ —Wall outlet, shelf.
- Ⓢ —Switch.
- —Furniture outlet.

Fig. 11.—Key to Wiring Symbols.

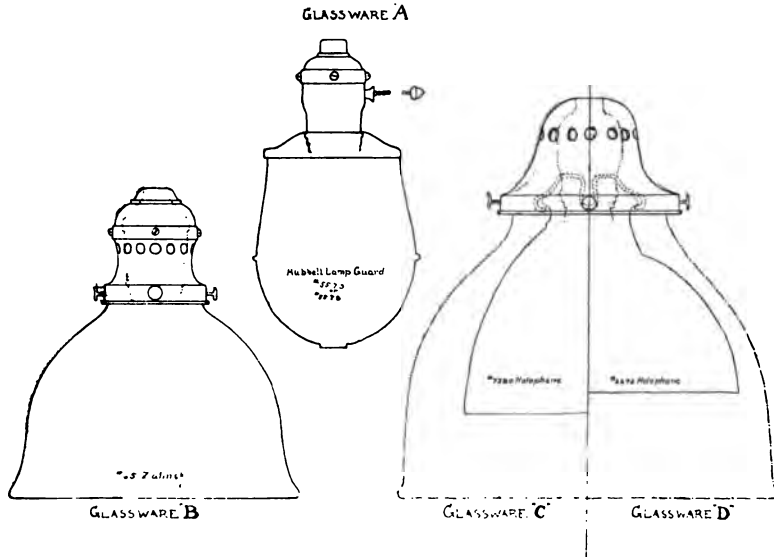


Fig. 12.—Glasswares A, B, C and D.

50 watt Gem lamps. The location of these reflectors is illustrated in the diagram, (Fig. 27).

Tests were made upon the low bookcases along the aisles.

These cases are provided with local illumination from 8-cp. carbon filament incandescent lamps on swing brackets which, when

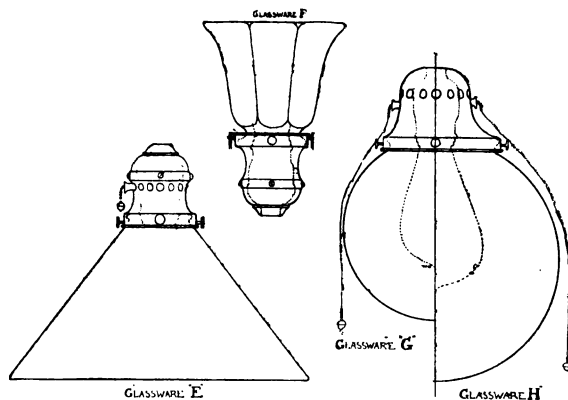


Fig. 13.—Glasswares E, F, G and H.

in use, extend 9 inches beyond the edge of the case but when out of use, are swung over the top of the rack in order to leave

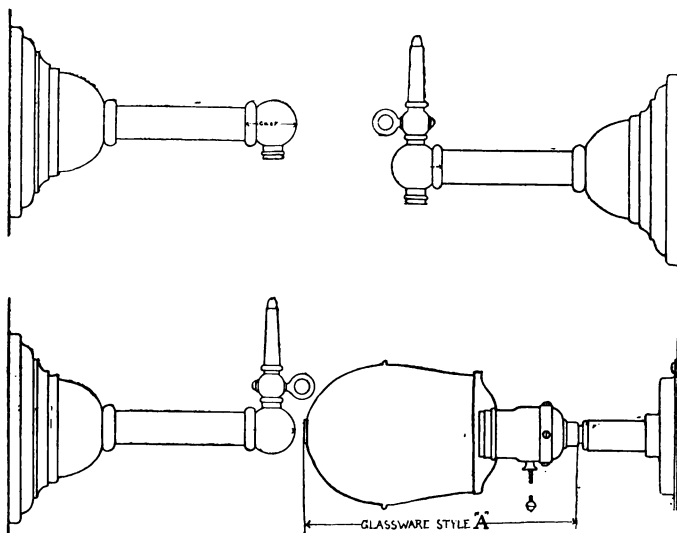


Fig. 14.—Fixtures Nos. 1, 2, 3 and 4.

maximum aisle space. These lamps are 44 inches above the floor and 6 inches above the top of the case. They are backed by opaque metal reflectors, shown in Fig. 29.

The round reading tables shown on the drawings are provided

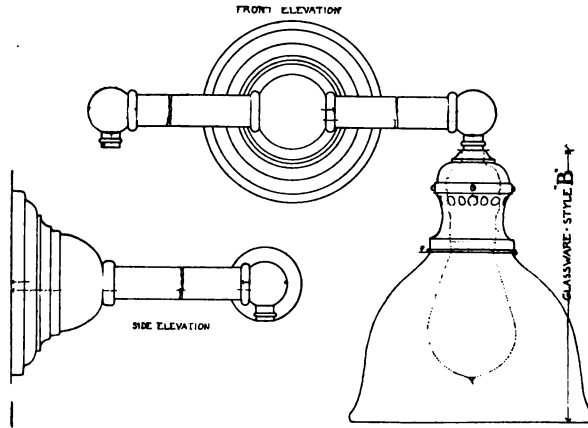


Fig. 15.—Fixture No. 5.

with local illumination from 40 watt frosted tantalum lamps in single lamp fixtures having 14 inch opal dome shades, green on

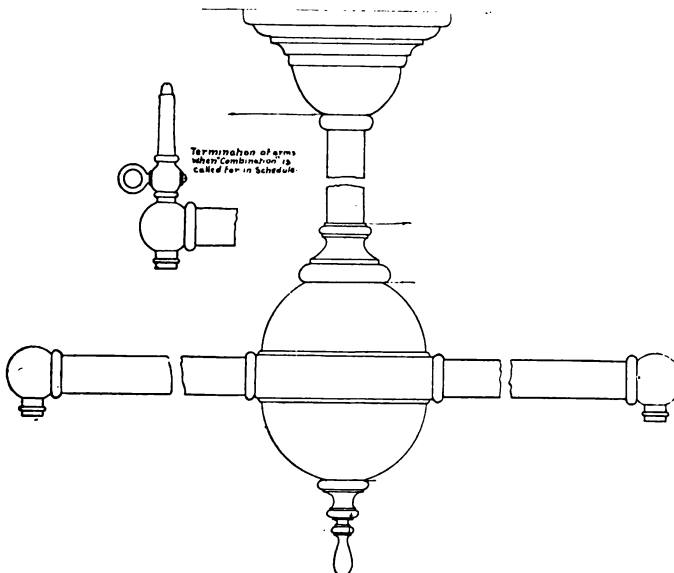


Fig. 16.—Fixture No. 6.

the outside. Immediately over the lamps and inside the dome shades are placed prismatic reflectors. These fixtures are placed

at the centers of the tables, with the tantalum lamps 20 inches above the table top, as shown in Fig. 30.

The rectangular tables (Fig. 29) in the rear of the room, are illuminated by frosted 16 c.p. Edison lamps, equipped with reflectors of the same type as those used on the round reading tables. The test was made on one of the tables which was equipped by mistake with 40 watt tantalum lamps instead

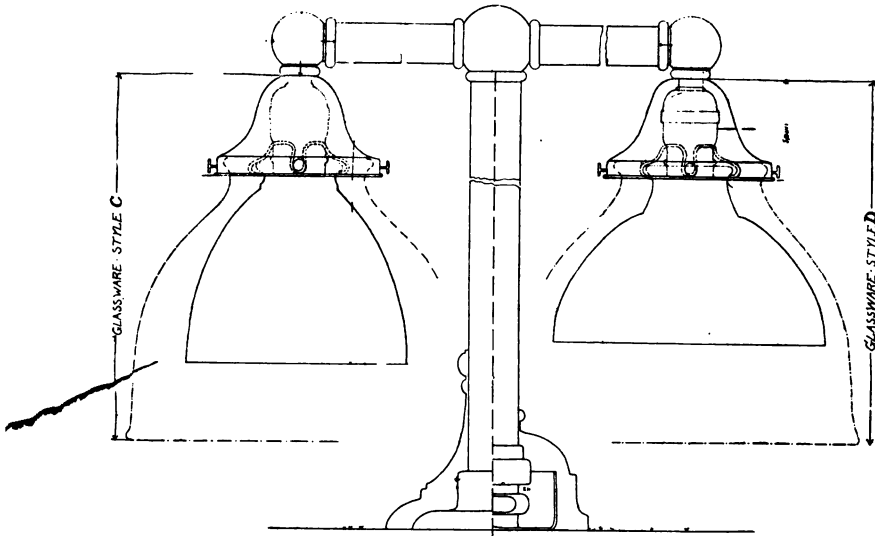


Fig. 17.—Fixtures Nos. 7L and 7R.

of 16 c.p. Edison lamps, and the error was not discovered until it was too late to complete further measurements with lower candle-power lamps in time for presentation in this paper.

Figure 31 in a plan of the reading room showing the approximate location of tables and light sources. In this case 125 watt tip-frosted Gem lamps are used in conjunction with a temporary installation of prismatic reflectors sand blasted inside. The tables are not fastened as they are in the floors below.

CONDITIONS OF TEST.

Most of the lamps in this installation were installed over two months ago and have experienced a normal amount of service since installation. As slight fluctuations in voltage were to be anticipated, and as it was desired to obtain results which would

be free from the influence of such fluctuations, it was decided to make the photometric comparisons with a standard lamp operated

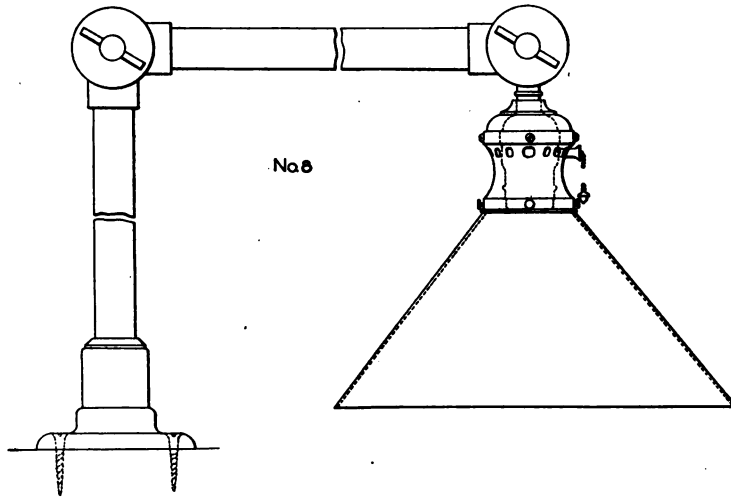


Fig. 18.—Fixture No. 8.

from the lighting system, and subject to the same fluctuations in voltage as were the lamps which were under test. Under these

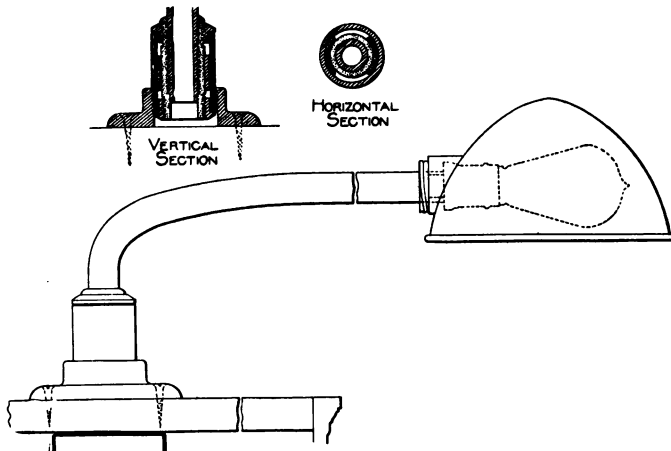


Fig. 19.—Fixture No. 9.

conditions accurate results are secured which are intercomparable.

On the first floor tests were made to show the amount of general illumination and also to show illumination produced by both the ceiling lamps provided for general illumination and the lamps provided for local illumination.

METHODS OF TEST.

The intensity of vertical illumination was measured at points

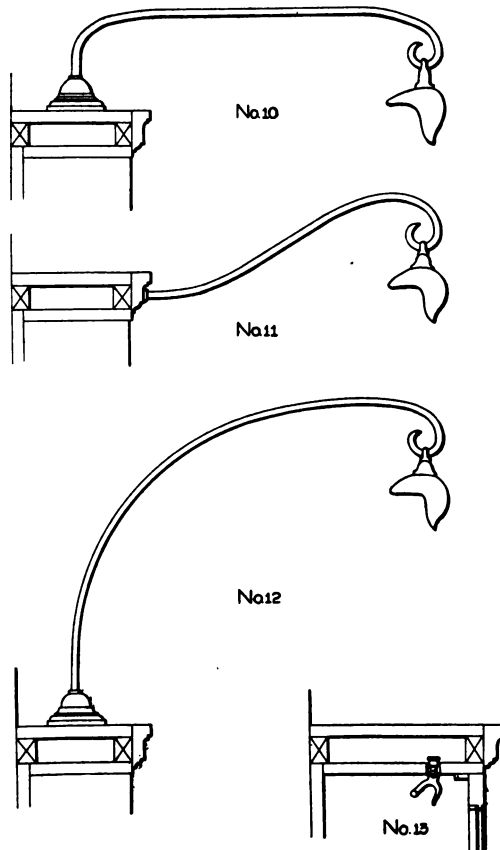


Fig. 20.—Fixtures Nos. 10, 11, 12 and 13.

on the fronts of stacks and bookshelves where it is desired to read titles on the backs of books. Tests were also made of horizontal illumination in aisles immediately in front of stacks to show illumination on books opened and held in such positions

for casual inspection. Other tests of horizontal illumination were made upon reading tables.

In conducting these tests a Sharp-Millar portable photometer was used. In tests of vertical illumination at the book stacks the photometer was placed on the shelves with the illumination test plate vertical, and in the position occupied by the title of a book. An observation under these conditions is equivalent to viewing the title from a point directly in front or to viewing

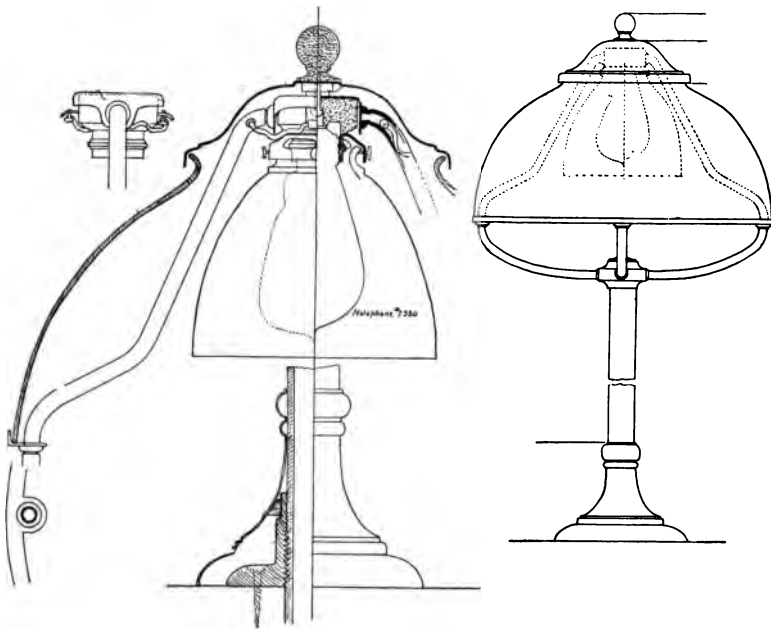


Fig. 21.—Fixture No. 14.

the test plate from a point in a line normal to its surface. Other tests of the same values were made by placing white blotting paper (used as a test plate) vertically over the backs of the books, and observing it through the photometer located at the point from which one would naturally view the titles of the books in practice. This constitutes a determination of the illumination intensity through observation of the test surface at angles varying from 45 degrees above to 40 degrees below the normal, depending upon the height of the shelf.

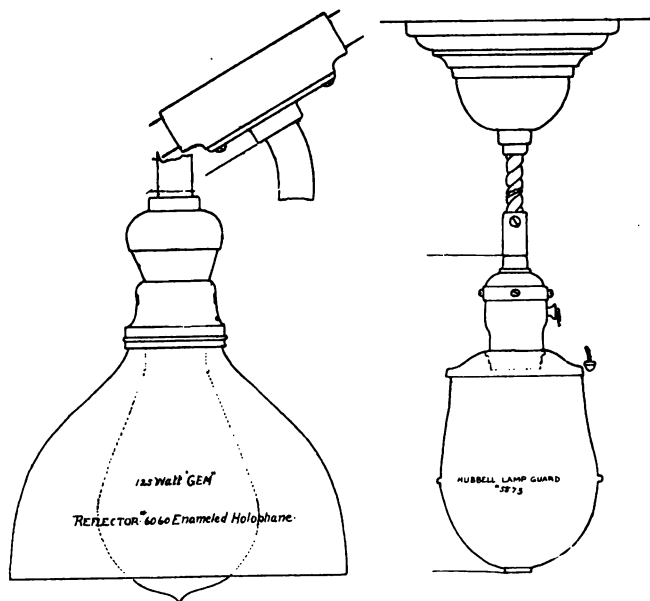


Fig. 22.—Fixtures Nos. 16 and 15.

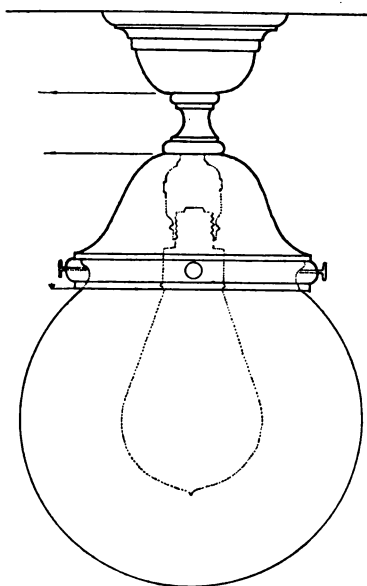


Fig. 23.—Fixture No. 17.

In all cases the illumination is stated in terms of that produced by a standard lamp placed at a known distance from the test plate which was viewed as in the test.

RESULTS OF TESTS.

Results of tests of general illumination in all the principal

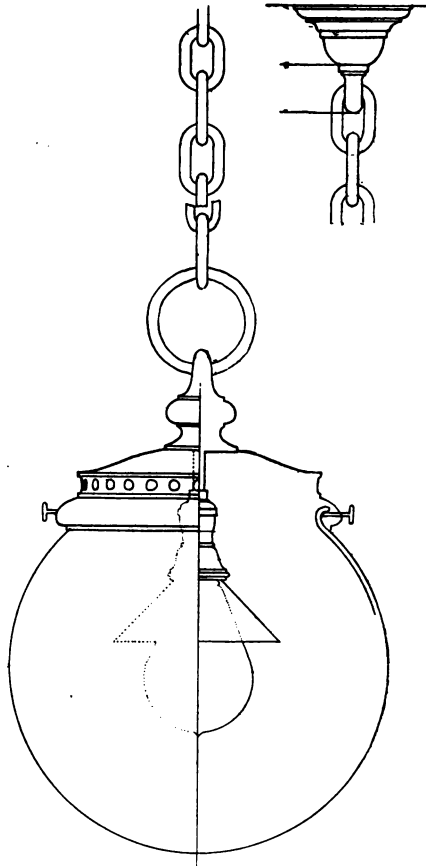


Fig. 24.—Fixture No. 18.

working positions in the room are shown in foot-candles on the accompanying chart, (Fig. 26). The measurements were made on a horizontal plane approximately 3 feet above the floor. The average of all values is $1\frac{1}{10}$ foot-candles. Data for this floor are as follows:

First Floor.

Area, square feet.....	2950
Contents, cubic feet.....	44950
Watts, general illumination.....	2316
Watts, localized illumination.....	4174
Total watts.....	6490

General Illumination.

Watts per sq. ft.	0.78
Watts per cu. ft.	0.05
Average foot candles on horizontal working plane	1.1
Foot-candles per watt per sq. ft.....	1.4
Approx. spher. candle-power per sq. ft.....	0.2
Approx. spher. candle-power per cu. ft.....	0.012

Free Standing Book Stacks.

Results of the vertical illumination on book stacks are shown

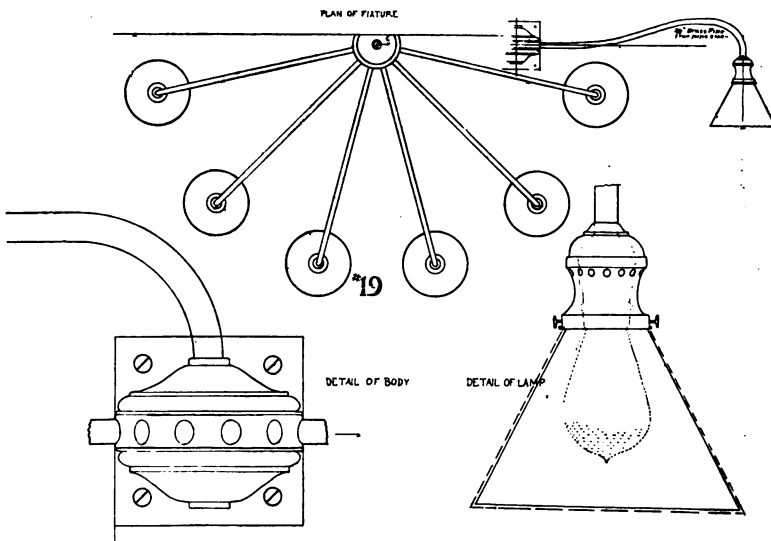


Fig. 25.—Fixture No. 19.

in foot-candles on the accompanying diagram, (Fig. 28), the approximate location of the test plate being indicated by the position of the foot-candle values on the diagram. The figures marked (*) indicate results of test obtained with the photometer on the shelves. Figures underlined indicate results obtained by viewing the test plate through the photometer from the position which

would probably be assumed by the average observer. This

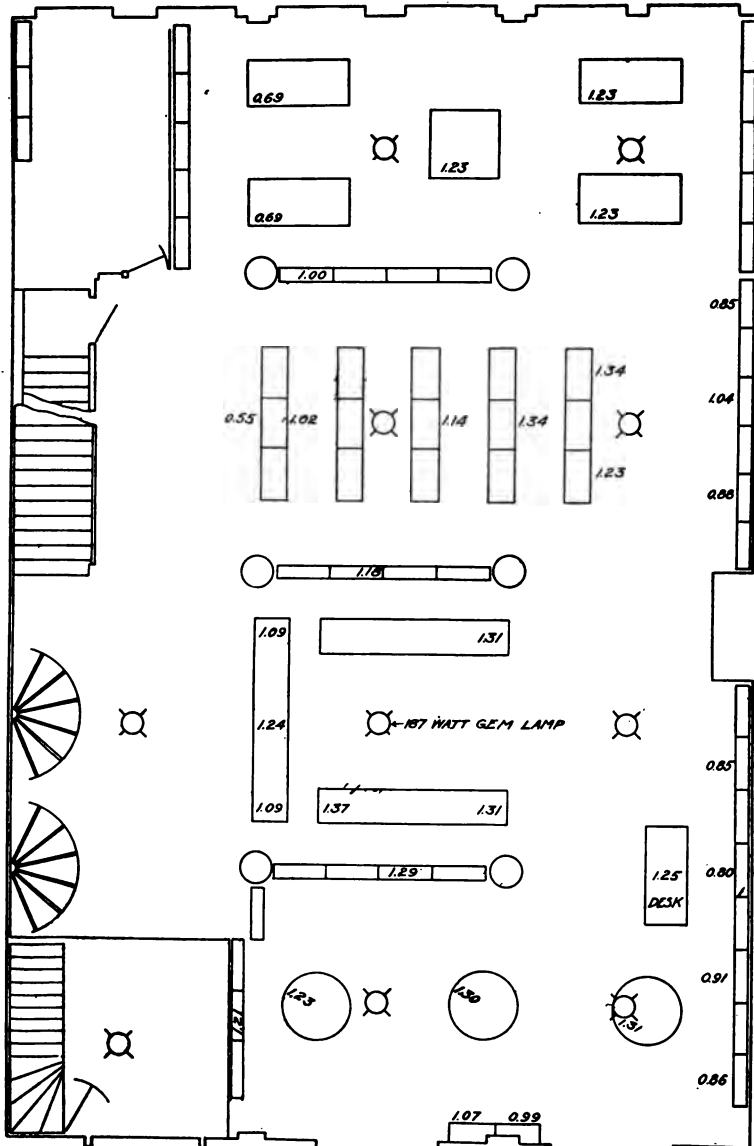
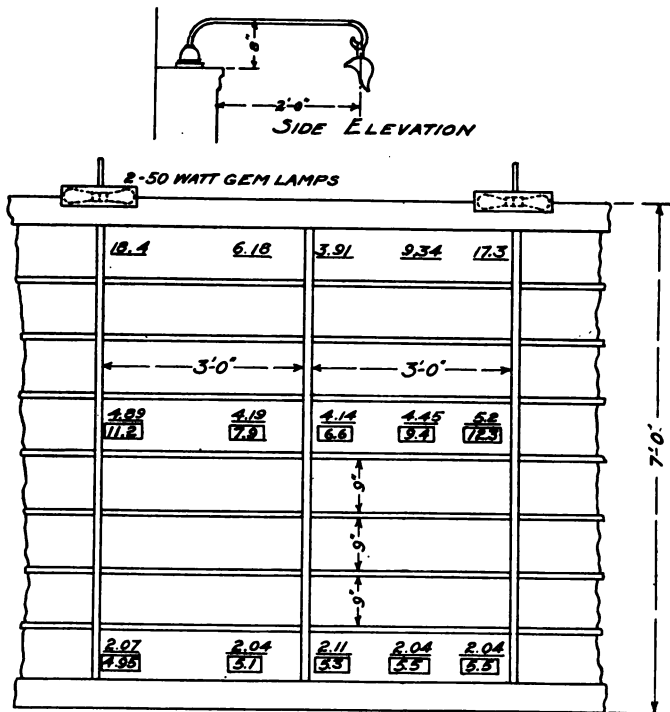


Fig. 26.—First Floor Illumination, all Local Lamps Being Extinguished.

shows that a considerable difference is found when the test plate

is viewed from different angles and when test plates of different character are used.

Tests were made to show horizontal illumination immediately in front of the stack in position where one would be likely to hold a book removed from the racks for casual examination.



FIGURES UNDERLINED SHOW FOOT CANDLES VERTICAL ILLUMINATION IN POSITIONS INDICATED
FIGURES IN SHOW FOOT CANDLES HORIZONTAL ILLUMINATION 11 INCHES AND 47 INCHES
ABOVE FLOOR.

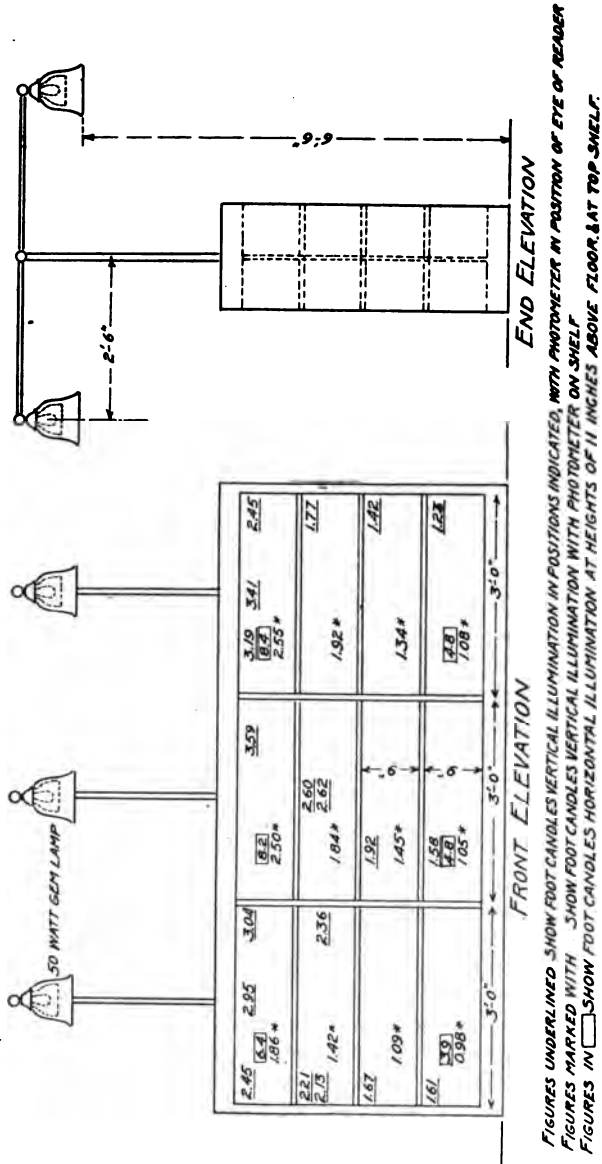
Fig. 27.—Illumination on Seven-shelf Wall Book-cases.

The results of these tests are indicated on the diagram in figures inscribed in rectangles.

Seven Shelf Wall Bookcases.

The foot-candles illumination as measured on vertical white blotting paper as described in the tests of the aisle book stacks, is shown in Fig. 27, the figures underlined representing the foot-candles, and their location on the diagram indicating the location of the test plate on the bookshelves.

As in the previous test, measurements were made to determine

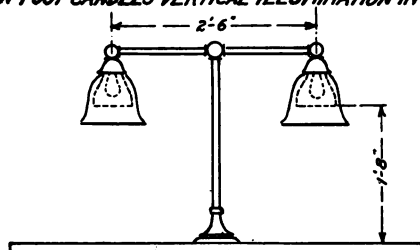
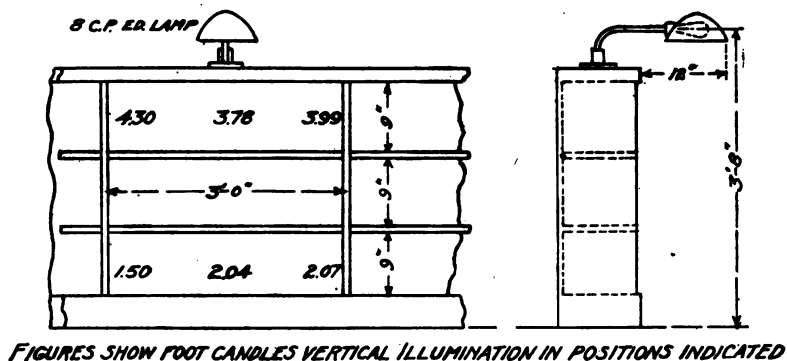


horizontal illumination in front of the bookshelves. These values

are indicated on the diagram in figures inscribed in rectangles.

Vertical Illumination on Low Bookshelves.

This test was conducted with a blotting paper test-plate as



ELEVATION.

MEASUREMENTS WITH 2-40 WATT TANTALUM LAMPS

NOTE: FIXTURE DESIGNED FOR LAMPS OF SMALLER CANDLE POWER.

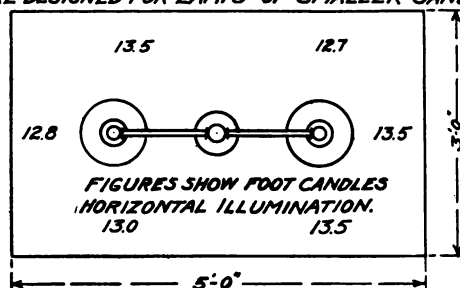


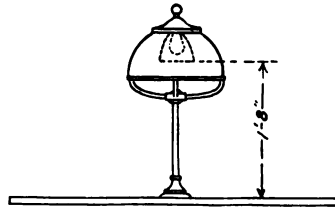
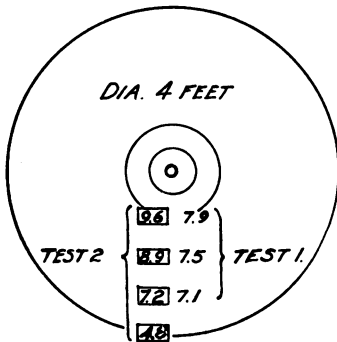
Fig. 29—Illumination of Low Book Cases and Rectangular Reading Tables.

described in the tests of the aisle book stacks. The results are indicated on the diagram, (Fig. 29), the foot-candle values being placed on the diagram in such manner as to indicate the location of the test-plate in the test.

Round Reading Tables.

Test 1. This test was made by placing the blotting paper as a test-plate upon the surface of the table and viewing it through the photometer from the angle at which the average reader would probably view a book and receive a minimum amount of regular reflection. The foot-candles illumination, angle of view and distance from the center of the table to test lamp, were as follows:

Distance from center of table to test lamp	Angle of view with the horiz.	Horizontal illumination
6 inches	50°	7.9 ft. c.
12 inches	50°	7.5 ft. c.
18 inches	50°	7.1 ft. c.



FIGURES SHOW FOOT CANDLES. ELEVATION READING TABLE LAMP
HORIZONTAL ILLUMINATION. 1-40 WATT TANTALUM LAMP.

Fig. 30.—Illumination of Round Reading Tables.

The illustration (Fig. 30), shows a plan of this table and location of lamp and position of the test-plate.

Test 2. This test was made on the round table in a similar manner except that the test-plate was viewed through the photometer from the angle at which a reader might view a sheet of paper placed flat on the table. It may be noted that the reader usually places his book near the edge of the table at which position the effect of regular reflection is practically negligible. Results of measurements in this test follow:

Distance from center of table to test lamp	Angle of view with the horiz.	Horizontal illumination
6 inches	40°	9.6 ft. c.
12 inches	50°	8.9 ft. c.
18 inches	67°	7.2 ft. c.
24 inches	90°	4.8 ft. c.

The foot-candle values obtained in this test are shown on the plan, inscribed in rectangles.

Rectangular Reading Tables.

A plan of one of these tables, showing the location of the two lamps which provide local illumination, is shown in Fig. 29. Horizontal illumination values determined as in test No. 2, of the illumination of the round reading tables, are given upon the

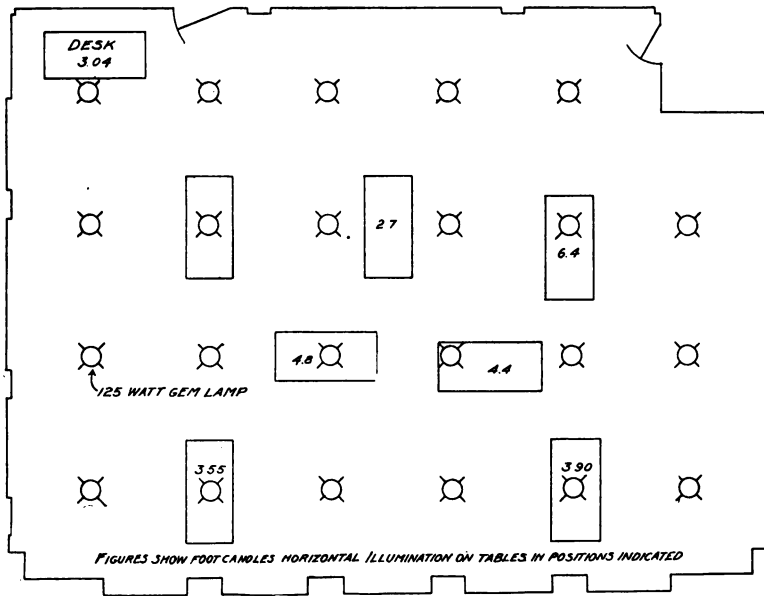


Fig. 31.—Illumination Measurements in Roof Reading Room.

diagram, the angle at which the blotting paper was viewed from the photometer, being in each case approximately 45 degrees above the horizontal.

Roof Reading Room.

These tests were made with the regular illumination attachment of the photometer. Results are shown on the plan (Fig. 31), in terms of foot-candles illumination, the figures showing at the same time, by their position upon the diagram, the location of the test-plate during the test.

FEATURES OF THE DESIGN.

(1) Freedom from glare. No unshaded lamps. Intrinsic brightness of lighting sources, $1/10$ of a candle-power per square inch of actual surface.

(2) General illumination combined with localized illumination.

(3) General illumination one foot-candle on horizontal working plane.

(4) Illumination (horizontal) on reading tables, average working conditions, 5 foot-candles.

(5) Illumination (vertical) on bookshelves $1\frac{1}{2}$ to 4 foot-candles.

Illumination (horizontal) on bookshelves 4 to 8 foot-candles.

(6) Combination of general and localized lighting designed to secure maximum illumination on the working spaces at minimum cost of operation for the required results.

Ceiling pendants for general illumination designed for efficient use of tungsten lamps.

(7) Flexibility. Design of switching arrangements for economical use of light. Lights near windows placed on same circuits so far as possible.

(8) Lamps for general illumination hung high but low enough to avoid sharp contrasts on the ceiling.

(9) Lamps for general illumination enclosed in 16 inch crystal glass globes roughed on the outside.

(10) Lamps for table lighting provided with prismatic reflectors designed to throw the maximum light sideways instead of downwards. Frosted lamps used.

(11) Lamps for lighting low bookshelves screened from view by opaque parabolic reflectors. Lamps for lighting wall bookcases, backed by opaque trough reflectors.

(12) Lamps for lighting free standing bookcases and reading tables screened from view by green plated glass domes.

(13) Lamps for lighting exhibition racks screened by reflectors with green celluloid covers.

(14) Wall bracket and column bracket lamps provided with deep enamelled glass diffusing shades of sufficient depth to hide the lamp. Frosted tip lamps.

(15) Cheerful appearance of room.

DISCUSSION.

Mr. N. W. Gifford :—The author gives 5 foot-candles for the illumination on a reading table and I should like to know if that is enough or too much. Is there not a possibility that the popular tendency is to use more light than is absolutely necessary in some places? Of course, generally we do not get enough. I think, however, that the possible tendency, is to give too much light for reading purposes. The matter has been somewhat investigated in school house lighting in Boston by a one-sided commission, which selected a value of 2.5 foot-candles, I believe. After making the report they said that each individual commissioner was not quite sure whether the right value had been chosen.

Mr. V. R. Lansingh :—Were the average of the values given on Fig. 26, used in obtaining the specified lumens per watt, or was the total area divided up into squares and the true average taken?

Mr. P. S. Millar :—The library described in this paper is the only well lighted library which I have ever seen. It is well worth visiting to study the effects produced. I want to express my personal appreciation of the spirit in which this paper is presented. These engineering data placed in our TRANSACTIONS for the benefit of our members are very valuable.

Mr. C. O. Bond :—It seems to me that, as time goes on, this Society will have to accumulate data of this kind which will eventually form a complete text-book for illuminating engineers. Illuminating engineers are certainly largely responsible to the next generation as to whether they shall wear glasses, be short-sighted or otherwise visually deficient. There is no place in which to begin so good as the public schools and libraries. Public schools are illuminated very largely by daylight, and the burden of failure in this respect will fall largely on the architect. The case of the library, is different ; school children, who may do their reading there, will probably do it mostly in the evening by artificial light. This lighting problem is therefore of the utmost importance, and I think every member of this Society who finds himself in New York would do well to visit this library and witness the success to which Mr. Millar has testified. If the Illuminating Engineering Society stands for anything, it stands

for the preservation of that best of all of the God given five senses—the sight.

I have sometimes thought that we might have a better name for] this] organaiztion than “The Illuminating Engineering Society,” and say openly that it is a society for the preservation of human eyesight, and we should move forward and take that wide ground, wide enough to allow untechnical people to come in as members of this Society also, as is clearly set forth in the Constitution and By-Laws, where it is stated that “a member may be anyone interested in the objects of the Society.” For this reason unless we include educational papers as well as technical papers, we shall fail in our mission. I say this, because there is among some members a feeling that merely educational papers should be barred from the TRANSACTIONS, if not from Section meetings. In my opinion, there is nothing that will be so beneficial to the Society in promoting its growth as educational papers. I dare say that in our midst there cannot be found ten men fully qualified to understand the technical discussions which take place, while we find ninety who are earnest and willing, but as yet cannot comprehend such discussions, and I personally am well down among the ninety.

We should make the work of the Society such that the people generally will join with us. I think Mr. Marks deserves the thanks of this Society for having been its able exponent in this way.

Mr. L. B. Marks :—With regard to the proper amount of illumination on the reading tables, there is some question. I investigated the conditions in the New York Public Libraries for a period of six months before attempting the illumination design, and came to the conclusion that 2.5 foot-candles under average working conditions is not nearly enough for some of the readers who frequent the libraries. There is a wide class of readers of various ages and conditions of eyesight. The print in some of the books and journals is fine and becomes more or less obscured through frequent handling of the pages. Some of the books are printed in foreign languages.

The design of the illumination is such that the reader may so place his book or other reading matter as to receive as high as 10 foot-candles or as low as 1 foot-candle, as evidenced by the tests. Near the edge of the table, in which location the book is

perhaps more frequently placed than in any other, the illumination is about 5 foot-candles when the book is flat on the table. Just outside the edge of the table the illumination is considerably less than this.

The book shelves must have a high degree of illumination, to enable the reader to decipher easily the titles of books without removing them from the shelves and to permit of local casual inspection of the contents of the books.

An important problem which came up for consideration in working out this design was that of general illumination versus localized illumination. It was decided that the best results in illumination for this case—intensity of illumination, economy, low intrinsic brightness, etc. being considered—could be secured only by a moderate general illumination supplemented by localized illumination on the working spaces.

With regard to Mr. Gifford's question, as pointed out by me, the illumination of the school room is quite a different proposition from that of public library lighting. An illumination that would be satisfactory in a school might not be at all adequate in a library in which the conditions that I have described prevail.

With regard to Mr. Lansingh's question, I pointed out in the paper that the value for the average foot-candles on the horizontal working plane was ascertained by taking the average of the illumination values given on the chart, Fig. 26. The test stations were not located with a view to equal spacing, but to represent the working spaces throughout the room. From this average value the lumens per watt, or foot-candles per watt per square foot were calculated. It is the value obtained by averaging the illumination values which were observed at the building but it is not the average value for the whole area. The value of the foot-candles per watt per square foot, measured in this way, would still compare quite favorably with the true average for prismatic reflectors and exposed carbon-filament lamps. The point is that it is possible to enclose the lamps entirely in diffusing globes as in the present library installation, and still obtain very good efficiency.

President Bell :—The Society owes a debt of gratitude to Mr. Marks for placing the data contained in his paper before his colleagues.





THE BORROWER WILL BE CHARGED
AN OVERDUE FEE IF THIS BOOK IS NOT
RETURNED TO THE LIBRARY ON OR
BEFORE THE LAST DATE STAMPED
BELOW. NON-RECEIPT OF OVERDUE
NOTICES DOES NOT EXEMPT THE
BORROWER FROM OVERDUE FEES.



B 7770.15
Design of the illumination of the N
Widener Library 005986364



3 2044 080 313 075

